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ABSTRACT

A study at Hong Kong University explored the use of the word processor as a writing tool in enhancing a process approach to writing instruction and the effect it has on writing performance, student attitudes to writing and revising, and the process by which students revise their scripts. A comparative analysis was done on a control group of 13 first-year industrial and mechanical engineering students and on an experimental group comprised of 12 first-year students from the civil and electrical engineering departments. On entry to the report writing course both groups were found to be comparable in terms of writing skills. Both groups also had the same instructor. The control group was taught in a conventional setting, doing all their work by hand, whereas sessions for the experimental group were timetabled in a computer laboratory and writing was done on word processors. Findings suggest that writing on the computer did produce immediate and direct effects on writing quality. Findings revealed no significant differences in opinions about pre-writing, writing, or revision strategies. Students in the experimental group, however, were more positive about the improvement and effectiveness of their writing. The experimental group revealed greater improvement in the revision process at the macrostructural level, particularly in the categories of substitution, addition, and permutation. Data suggest that use of the computer is a vast improvement in the process-oriented approach to writing. (Three appendixes of data and 26 references are attached.) (KEH)

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THE REVISION PROCESS IN ACADEMIC WRITING: FROM PEN & PAPER TO WORD PROCESSOR

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Part 1 : INTRODUCTION

1.1. The Process Approach

Teachers of academic writing have in recent years been turning their attention increasingly to the **process** of writing, and exploring process-oriented approaches to writing instruction (Murray 1978, Perl 1979 & Taylor 1984). Murray, for example, feels that the teaching profession's "normal obsession with product rather than process leads us towards dangerous misconceptions about the writing process," and that, "the process of discovery, of using language to find out what you are going to say, is a key part of the writing process".

This is not to underplay the importance of final products. Most writing eventually reaches a stage when the writer decides it is a 'final' product, whether that means readiness for publication, or simply for handing in to a teacher for assessment. The writer's aim is to reach a stage at which he is satisfied with his communication to the intended reader. Students of writing can only benefit from an approach which, instead of requiring a first draft as a final, unalterable product for assessment, encourages them to produce several drafts, with constructive feedback from tutors between drafts. Writing therefore goes through a kind of metamorphosis on its way to its final state, and it is important that students learn that this is a normal process even for a proficient and experienced writer.

Central to this notion of writing being a process, is the importance of the revision, or rewriting, stage. "...writing is a discovery procedure which relies heavily on the power of revision to clarify and refine that discovery" (Taylor 1984). It seems obvious that if students are to be able to clarify and refine what they want to say, then atomistic sentence-based or example-centred remedial instruction must be supplemented by the frequent revision of written drafts.

> "Teacher presentations of standard patterns of organization or discussions on how to support an argument certainly have their place, but there is no guarantee that the necessary skills will be transferred and that the students will be able to draw on the information when they actually need it. Showing students where their *own* arguments are weak or where *their* logic breaks down appears to be a more effective approach." (Taylor, 1984 - our italics)

Revising their own texts allows students the opportunity to reflect exclusively on their own writing problems and makes any feedback or commentary from the instructor immediately relevant. In this regard, it is important to distinguish between **first** drafts and **revised** drafts.

1.2. 1st Draft vs. Revised Draft

It is very difficult to make a clear distinction between, or even to clearly define, the notions of a **1st draft** and a **revised draft.** One difficulty in trying to make such a distinction is that a draft

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exists first in the mind, and is altered both before and during the actual act of writing, through deletions, substitutions and additions (Marder 1982). Nevertheless, in the context of university assignments, which are often undertaken (at least at Hong Kong University) under great pressure from other academic claims on students' time and attention, we can, for the purposes of this paper, distinguish 1st draft from revised draft in the following terms (assuming the pen-and-paper or type-written method as the norm):

a) Since most students do not have time to craft a preliminary version, complete with on-going deletions, substitutions and additions, and then write out a neat, unblemished copy, **a first draft** is, in most respects, the same as a completed first attempt, intended for submission as under exam conditions. The limited amount of revision of the written text that does go on at this stage, before handing in the assignment, tends to be at the sentence, rather than discourse level. There may be some students who choose to revise and edit work and then recopy, but these would seem to be in the minority (see e.g. Foulds 1987).

Exactly how students go about preparing their 1st draft is difficult to pin down other than by eliciting subjective writing protocols (e.g. Hayes & Flower, 1981). The computer offers us the prospect of being able to register each editing intervention as part of a linear record; we hope to be able to employ this technique in the near future[1].

A 1st draft is generally uninfluenced by another opinion; one can be 'too close' to a 1st draft and unaware of one's audience. Sommers (1980) writes of student inability to "re-view their work again with different eyes".

b) **A revised draft**, on the other hand, is an attempt to "clarify and refine" and tends to be made after consultation with others, particularly tutors, thus increasing the sense of audience. Of course, students could well 'consult' themselves, through that inner dialogue which helps a writer to distance himself from a text and develop a greater sense of audience. This ideal, however, assumes that the students already possess the necessary metadiscoursal awareness to determine when they are not communicating successfully with their audience, and to be able to rectify any shortcomings. But, as Taylor (1984) puts it,

> "Lacking nativelike intuitions about vocabulary, syntax, tone, style, formality, and organizational patterns, students often cannot see problems in their own writing (Beach 1979, Perl 1979) and will need to rely extensively on positive, constructive feedback."

Hence, since the goal of our instruction is to help students to develop these intuitions and self-questioning strategies so that effective revision can take place before submitting a draft for comments, we must explore ways to ensure interim feedback and guidance on an individual basis, and not necessarily always from the classroom teacher. Eventually, one would hope to be able to rely on effective regular **peer** evaluation as an integral part of the process in the writing classroom. The important thing is that in helping students to develop these strategies, feedback should be given between drafts, and not merely as an assessment of a final product.

1.3. Holistic Writing

The emphasis in this paper is more on the contribution teachers can make to a move to a more learner-centred, process-oriented and **holistic** approach to the development of writing skills.

We need particularly to ask what it is exactly about students' writing that teachers are concerned with improving at the critical stage between the first and revised draft. In the area of academic expository writing, especially at the tertiary level, the emphasis has increasingly been placed on improving not only morpho-syntactic accuracy and fluency, but also rhetorical features like the cohesion, coherence, organization and overall communicativity (dare one say "communicative dynamism"[2]) of discourse. A concern with such features is what Marder (1982) calls the attempt to reduce the "entropy", or processing disorder, of the text in relation to the reader, by ensuring familiarity with content and an appropriate level and proportion of abstraction and density of relationships. All of these factors - and not simply grammaticality and fluency - contribute to the communicative quality of the text and consequently they all need addressing in the teacher's comments. This kind of feedback will enable the student to develop an ability to view the text 'holistically', to look beyond words, sentences, or even paragraphs, and to assess how well the entire text is achieving its rhetorical goals.

Researchers (Beach, 1976 and Sommers, 1978) have found that good writers have a much better grasp of both of these factors than poor writers. Good writers tend to think in terms of general patterns of development and view their work holistically, both at the conceptual and the revision stage of the writing process. It is therefore vital for writing teachers to address such issues. Windhover (1982) states that the main concern of an academic writing programme is that students "learn to view their own writing holistically so they can make major revisions." In short, a holistic approach to revision will enable students to develop the ability not only to judge whether the main verb in a given sentence agrees with its subject, but more importantly, to what extent their writing is appropriate for the rhetorical situation (genre) and how well it fulfils its rhetorical goals.

1.4. Re-writing Apprehension

Practical experience, however, has taught us that this emphasis on the process of writing and on producing several drafts has a number of drawbacks. One is that no matter how crucial the teacher makes the rewriting stage for students, there is no denying the drudgery of the process. Students face the prospect of re-writing with varying degrees of what Daly & Miller have called "writing apprehension" - although in this context we consider the term "**re-writing apprehension**" more appropriate. Re-writing can invoke both a sense of shame and disappointment at the failure of the first draft and apprehension at the thought of a time-consuming total re-write. Murray (1978) goes as far as to refer to a punishment factor when talking about re-writing. This may be due to the students' own feelings about rewriting, but can equally be a result of the way revision is viewed by the teacher.

Teachers who require rewrites do not necessarily do so because they see this as a necessary part of the writing process. In some cases a request for a rewrite may be restricted to those students whose work is felt to need the most radical revision because the finished product is below a certain standard. This approach seems to shift the focus away from the value of the process of revision and onto the product, since, as Higgins & Johns (1984) have noted, "implicitly the students are being trained to submit their first effort as the final version". The rewriting is only required because the first draft was an unacceptable final version.

Even if we assume that the teacher does impress upon students that revision is a necessary, routine and desirable phase in the writing process, there still remains a second important factor which increases rewriting apprehension, and which compounds the problem of a sense of punishment. This is what Kemmis (1979) calls "inauthentic labour". Phillips (1986) defines this as "the non-productive work generated as a side effect of the task to be accomplished". In the context of revising texts, this **non-productive work** is the laborious task of copying those parts of the first draft which one does not wish to change. Foulds (1987) recognizes that there is a "natural unwillingness" on the part of students to rewrite since this is indeed a "dreary business". Although

professional writers like Neil Simon might think of the rewriting phase as the "fun" part of writing[3], we cannot expect the same degree of commitment or involvement from students required to re-write routine academic reports or essays, especially when the task in large part consists of laborious and educationally (almost) valueless copying.

1.5. Rewriting or Revision

It is important at this point to make the crucial distinction between our use of the terms **rewriting** and **revision**. In this paper, we take rewriting to be the total rewriting of a text for lack of any simpler or shorter means of producing a significantly altered hand-written or typed version; the emphasis is on what the writer *does*: i.e. literally 'writing again', which may often be a largely mechanical operation involving extensive copying. Revision means literally "seeing again" and is a higher level cognitive operation, the process by which a text is critically overhauled to enhance its effectiveness in getting a message across to the reader.

If a text is "re-written", there is no connotation of the degree of alteration, merely the fact of alteration. Certainly, students often fail to see the value of "rewrite" revision in terms of substantive changes, since so much of their time is spent on semantically-empty copying. From a student's perspective, **revision** places the emphasis on the changes to be made - a constructive activity - while **rewriting** places the focus largely on what is to remain the same. Rewriting is therefore seen as a tedious but necessary consequence of revision.

1.6. The "Student-Centred" Approach

It is perhaps paradoxical that teachers increasingly adopting a "student-centred" approach to language instruction are also reluctant to demand wholesale rewriting of their students. The result is another important obstacle to teaching writing as a process. Even though teachers might believe in theory that the only satisfactory means of effecting holistic writing revision is to require extensive rewriting, in practice they are sensitive to the punishment-factor and to the non-productive labour involved when assigning a total rewrite . This sensitivity greatly affects what teachers routinely require from students. Moreover, as we have already mentioned, if the teacher wants to improve the communicative quality of the student's work after the first draft, we may assume, at least at the tertiary level, that there will be two levels of commentary. The first is at the rhetorical level, addressing the written discourse as a whole, while the second is at the morpho-syntactic level, limiting the focus to isolated words or sentences.

The question then arises as to which level of feedback the teacher expects the student to respond to at the revision stage. Because the teacher is aware of the non-productive labour and punishment factors, students are often only required to act on comments on grammar, vocabulary and style. More than that would involve large-scale rewriting and might seem an unreasonable request. Teachers might therefore require students to rewrite only parts of their texts. But if good writers, as Sommers suggests, conceptualize the blueprint of their draft as a whole when they revise, and are concerned primarily with finding "a framework, a pattern, or a design" for their argument, then instructors should be aiming to develop such skills. It would seem to defeat the object of the revision exercise to ask students to merely focus on certain parts of their texts.

If we are reluctant to make students revise their entire texts, then why do we make comments on rhetorical structure? The hope is, of course, that the student can internalize the comments and apply them to the next assignment. If, however, we agree with Taylor that in order to maximize the transference of skills from one situation to another students need constructive feedback on their own texts, then it would seem logical that they should also be encouraged to act directly on the teacher's comments on rhetorical structure.

We are faced then with an awkward dichotomy. On the one hand teachers feel rewriting to be essential if their students are going to develop a sense for what is good rhetorical organization, and on the other they are hesitant to ask for it because of these 'negative' side-effects of requiring students to rewrite sizeable chunks of text, or indeed entire assignments. It is therefore ironic that the increased sensitivity to the human factor in language teaching may unwittingly be preventing student writers from acquiring the necessary skills for holistic revision, only perpetuating what Sommers (1980) calls the "inability to *see* revision as a process".

1.7. Pen-and-Paper vs. Word Processor

However much one wishes to centre a course around the writing process, the conventional pen-and-paper, or even typewriter, medium obliges the writer to engage in complete re-writing, with all the issues of redundancy and demotivation that entails. The **word-processor**, on the other hand, offers teachers of writing the opportunity to focus student energy on creative writing at all times.

It is in the light of our overall diagnosis of problems with 'pen-pushing' writing courses that the move to computer-assisted revision appears to be such a promising alternative and potential solution to a problem which, though apparently largely logistical, is at root one of conception. Are teachers, in their desire to effect improved writing competence, emphasizing the process or the product? The conventional approach, pen-and-paper or typed re-write, with all the accompanying drawbacks we have already mentioned, seems to us to impede both a process approach to writing improvement and a holistic view of text revision. On the basis of evidence presented by other researchers (Daiute, 1985; Phillips, 1986, Higgins & Johns, 1984) we hypothesized that using the Word Processor as a writing tool might encourage or enhance a process approach to writing instruction.

We therefore undertook a pilot comparative study, with 2 groups of 1st-year Engineering students at Hong Kong University, to explore to what extent the computer is, as Daiute describes it, "...the perfect writing tool for a process approach to writing".

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Part 2 : THE STUDY

2.1. Introduction

Information was sought on 3 fronts: students' **attitudes** to each medium, their **performance**, and the **processes** they use in revising by each method.

a) Experimental Hypotheses

Our **experimental hypotheses** were that the use of a word processor has an effect on:

A. writing performance

B. student attitudes to writing and revising, and

C. the process by which students revise their scripts

We hoped that the results of the study would also enable us to provide some initial answers to a question posed by Martin Phillips (1986), namely:

> "....to what extent (will) the ways in which we propose to exploit the computer lead to positive benefits in terms of their impact on methodology?"

b) Experimental Design

This study took place between September 1987 and March 1988, at the University of Hong Kong's Language Centre. A control group of 13 first-year industrial and mechanical engineering students, and an experimental group comprising 12 first-year students from the civil and electrical engineering departments, both followed the Centre's 20-hour report writing course for engineers over a 10 week period. On entry to the course both groups were found to be comparable in terms of writing skills. The division between departments (industrial/mechanical and civil/electrical) was determined by timetable restrictions. Both groups had the same instructor so that course content and methods of instruction were, as far as possible, identical. The control group (hereafter referred to as "P group" - for pen-and-paper) were taught in a conventional classroom setting, doing all their writing by hand, whereas sessions for the experimental group ("C group" - for computer) were timetabled in a computer laboratory at the University's Computer Centre, and did their writing on word processors.

In order to monitor their **performance**, students sat pre- and post- course tests. Both groups wrote these tests by hand under examination conditions. Requiring the C group to complete the test on word processors might have been more appropriate, but would not have allowed a valid comparison of the two groups' results given the unpredictability of computer networks and the need for 'clockwork' timing in exam sessions. Indications of students' **attitudes** to writing were gained from pre- and post- course questionnaires. During the course students were asked to complete a number of short written assignments and three drafts of a long report. All of these assignments were written by the C group on word-processors. The written texts were analyzed in an attempt to measure any improvements in writing performance. The questionnaires, together with further analysis of the three drafts of the long report, also provided information on the strategies students employ in the **process** of writing.

2.2. PERFORMANCE

2.2.1. Methods

a) Pre-Course Tests

All students wishing to follow an engineering course at the University must obtain a grade 'E' (the lowest Pass grade, the highest being 'A') on the Hong Kong Examination Authority's Use of English paper. This examination is designed to test general language proficiency. Since the results of the UE examination are simply given in the form of a grade on a scale of A to E, it was difficult to subject these grades to any statistical analysis.

On entering the University, all engineering students sit the Language Centre's placement test. Based on their performance on this test, the weaker 50% of students are selected for the academic report-writing course. The placement test comprises a report-writing task and a C-test. Student responses on the C-test were marked on a right/wrong basis. The writing task required students to write a report from information provided in the form of graphs, notes and tables. The scripts were given a subjective impression mark by two separate markers on a 1 to 7 scale. The results from these two tests were subjected to statistical analysis using a simple t-test and a Mann-Whitney *U*-test to ascertain whether there was any measurable difference between the groups before the course began.

b) End-of Course Projects

Towards the end of the course all students worked on a problem-solving project during which they had to devise a scheme fulfilling the electrical energy requirements of a small fictitious island. Students worked in groups at the pre-writing stage, discussing options, doing calculations and making oral presentations to the rest of the class. Each group was asked to work as a team to come up with a plausible solution, but students then wrote reports outlining the scheme and justifying their arguments on their own.

After writing the first draft of this report, the students received comments on the rhetorical features of their texts, as well as on the content. After a feedback session looking at common problems arising from the drafts, students were asked to rewrite the reports. This second draft was marked for spelling, lexical, stylistic and grammatical appropriateness, and students were asked to edit it to produce the third and final draft to be handed in for assessment. It was at this stage that the texts were graded. All of them were later typed on a computer (the different impressions made on the reader by handwriting/printout being an unwanted variable) and graded by two experienced markers who had taught the course but who did not know the students. A marking scheme was used which was designed to assess general writing proficiency and grades were again awarded on a 1 to 7 scale, according to success in meeting the rhetorical objectives of the course.

c) Post-Course Achievement Test

After completing the course all students sat an achievement test, designed to be a parallel test to the writing task on the placement test. The scripts were marked in the same way as in the placement test using the same two markers and a 1 to 7 scale. The markers were again asked to focus specifically on the rhetorical and linguistic skills taught on the course. Again, the results were subjected to statistical analysis, using a t-test and the Mann-Whitney *U*-test.

2.2.2. Results (See Appendix 1)

The P group scored somewhat better than the C group in the UE examination. A Mann-Whitney *U*-test (used because of a large variation in SD's between groups) also revealed that the P group scored significantly higher ($p < .05$) on the C-Test. These two results together suggest that the P group were more competent than the C group with regard to general language proficiency. On the pre-course writing task we also used a Mann-Whitney *U*-test, again because of the large difference in SD's between the two groups. This time the analysis revealed no significant differences. It was therefore concluded that although the two groups differed in terms of general language proficiency, they were comparable in terms of writing ability when the course started.

The Grades from the long projects (written by the C group on word-processors) showed much closer SD's between groups using both marking schemes. This time, we did both a t-test and a Mann-Whitney *U*-test on the data. Neither test revealed any significant difference between the two groups in either of the assessments. The results of the post-course test, written by hand by both groups, showed that the C group performed significantly better than the P group both when compared using the t-test ($p < .02$) and the Mann-Whitney *U*-test ($P < .05$).

2.2.3. Discussion

Since the duration of the course was so short (only 10 weeks) and the hours of instruction so few (20), we did not expect that writing on the computer in itself would produce any immediate and direct effects on writing quality. We were somewhat surprised, then, to see that the C group appeared to show significantly greater improvement than the P group on the post-course test. However, a further analysis of the data suggests that another variable, not the use of the computer, might account for the difference. The C-group SD's in the pre-course tests were much higher than for the P group, signifying a greater range of ability within the C group and more students at the lower end of the ability spectrum. We would consequently expect these students, who have greater room for improvement, to push up the mean for the group as a whole on the post-course test. We would not expect the mean of the P group to alter dramatically, since the range of ability within the group seems to be much smaller. This 'catch-up effect' seems to provide the most convincing explanation, especially since the post-course test was written by hand by both groups. When marked for general writing proficiency, the projects, which the C group wrote on word processors, again showed the C group had a higher mean score, although the difference was not significant.

These results seem to confirm what our basic teaching intuitions told us, and what writers like Pierson & Leung (1987), Foulds (1987), Daiute (1985) have found - namely, that computers do not in themselves produce good writing, at least not to a degree that we could confidently measure after so short a course. More interest is now being directed towards the effect they have on attitude and the writing process. However, if the computer's influence on *these* factors is sufficiently positive, then there is the possibility that we can still expect improved writing quality from students in the long run. The 'catch-up effect' noted in the post-test results could well be due, at least in part, to the positive effect the word-processor has on student attitudes.

2.3. ATTITUDE

2.3.1. Methods

Before the course began, both groups were asked to complete a **pre-course questionnaire** which was designed to determine

a) what strategies engineering students think they employ when in the process of writing, and

b) what their attitudes are towards writing.

At the end of the course, students were asked to fill in a **post-course questionnaire** in order to find out how students thought

a) they had written their assignments during the course, and

b) they would write assignments in future.

A staff-student **consultation meeting** was held when the course had finished; all engineering groups on the writing course, including our control and experimental groups, were represented by elected students. The purpose of the meeting was to get direct feedback from students with a view to evaluating the course and revising it for future classes. We were also particularly interested in hearing students' comments on writing on the word-processor.

2.3.2. Results

a) The Pre-Course Questionnaire

There were no significant differences between the two groups with regard to attitudes towards the writing process. In the pre-writing stage the responses varied a great deal from individual to individual, though few students (25%) in either group said that they write detailed plans. When writing their assignments, students from both groups stated that they spend time thinking what they are going to say before writing so that they do not have to rewrite afterwards. Few students (25%) reported that they write quickly knowing they can change their work later.

However, the majority of students estimated that they do spend some time revising and editing their work, and of these, one third admitted to re-copying it. When asked to indicate how important they thought it was to revise their own work, nearly all students thought it important or essential. However, they saw it as more important, on the whole, to revise before receiving a teacher's comments than after.

b) The Post-Course Questionnaire (See Appendix 2)

Responses to this questionnaire revealed that there were very few differences between the two groups as regards pre-writing, writing or revision strategies. Slightly more students in the P group said they wrote detailed plans before writing and that they would continue to do so in future. More students in the P group said they spent time thinking before writing their assignments, even though they knew they could change their texts later. 4 students (33%) in the C group said they spent *quite a lot/a great deal* of time revising the structure of whole paragraphs, compared with only 1 student (7%) in the P group.

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There seemed to be no major differences between the groups in terms of *ease and enjoyment* totals. However, when we look at the break-down of these totals, we see that the C group found writing assignments both easier and more enjoyable, while revising was easier though slightly less enjoyable. It is at the editing stage, however, that the C group's responses were most negative.

The most striking difference between the groups was in how *effective* they felt their writing of the assignments was. 7 of the computer students (58%) felt their writing to be *quite effective/very effective*, whereas 12 of the P group (92%) felt it was *okay/not very effective*. The C group seemed to feel more positive about the effectiveness of the course in improving their ability to write assignments. If not required by their tutors to revise or edit their work, slightly more students in the C group thought they would revise organization anyway, while slightly more of the P group thought they would edit for grammar, spelling and vocabulary.

The final question on the post-course questionnaire asked the open question, "*Do you think the course has changed the way in which you write your assignments? If so, in what way?*" Almost all students (22/88%) felt the course had changed the way they wrote assignments. The P group concentrated their comments on the content of the course, feeling that it had improved their organization, revision skills etc. The C group wrote much longer comments, stressing the value of the computer as a writing tool. Of the 11 students who wrote something, 5 (45%) mentioned that the computer made revising, editing and rewriting easier. 5 also felt a computer printout improved the appearance of their work; as one student put it, "*Usually my assignments are not tidy, but now by using the computer, it gives me the impression that my work is tidy and easier to be read.*" 4 students (36%) felt that it took them longer to write assignments on computers because they did not know how to type. Of these, 2 (18%) qualified this by saying that the time spent was worth it since the appearance of their work was improved.

c) Staff-student consultation meeting

This was attended by five students representing the six engineering writing classes. The C group representative said that his group liked writing and revising on computers, whereas the P group's representative said although his group felt revising was useful, they did not enjoy it. There was some discussion on the possible use of the computer to write assignments in future during which several students said they would like to be given the choice between writing on computers or by hand. 3 representatives went on to say that if given the choice they would still prefer to write by hand. Inability to type and slow typing speeds were cited as the reasons for the reluctance to use computers.

2.3.3. Discussion

a) The Pre-Course Questionnaire

Our main aim in giving this questionnaire to students before the course began was to gain some insight into the way students ordinarily tend to write assignments; we felt this would, at least to some extent, offer a reflection on what they had previously been taught.

It appears that the majority of students think a lot before writing, and very few write quickly with the intention of changing the draft afterwards. This could be due to the notion, gained through years of experience in secondary schools, that any draft handed in to the teacher is the final

product. Students tend to have a sense of 'completeness' when they produce their first draft, and there is little notion of writing being a process. This is a notion that is difficult to 'un-learn'.

Another result which seems to indicate an emphasis on the final product, is that while nearly all students felt it was *important/essential* to revise/edit their work, most thought it important to do this before receiving a teacher's comments. They are obviously unused to getting work back with comments which they are routinely expected to act upon. The sense of failure and punishment attached to a request to rewrite a text seems quite understandable in the light of these comments, since rewrites are not associated with the 'normal' writing process.

b) The Post-Course Questionnaire

It appears from these results that although there was no major difference in responses between the groups after the ten weeks, there was a move towards a more flexible approach by the C group, in the sense that they now had ease of revision in mind before they started writing. Both groups were told before writing that they could change/revise their work later, and the P group were told they need not rewrite the entire text but could "cut and paste" to facilitate the production of a revised draft. Nevertheless, the P group spent longer thinking before writing than the C group. This could well be because, even with the cut and paste facility, revision with pen-and-paper is still much more time-consuming and burdensome than with the word processor.

The fact that more students in the C group said they spent *quite a lot/a lot* of time revising the structure of whole paragraphs appears to have two possible explanations. Firstly, it may be that the C group simply took longer to accomplish the same type of revisions as the P group. This, however, seems unlikely. Even given that the P group could cut out sentences and re-arrange them, it is hard to believe that this is a faster method than using a computer to move text around on the screen. A more likely explanation seems to be that the ease with which the C group could manipulate paragraph structure meant they spent more time considering this aspect of their text revision.

Several factors might account for why editing seemed to be easier for the P group. Firstly, several of the C-group students were totally unfamiliar with word-processing on computers. Secondly, those students who were familiar with word-processing were nevertheless unfamiliar with the software program the University employs (PC-Write). Thirdly, poor typing skills were cited by 2 (18%) students[4] as the reason why they found working on the word-processor took longer - even for adding, deleting, substituting short phrases, single words or letters. These initial difficulties with computers are common to most beginners. Almost all who regularly use computers, however, see the difficulties with the mechanics of typing and so on as short-lived. At 20 hours, only half of which was actually spent on the word processor, the course did not allow students time to develop familiarity with the medium. We would hypothesize, therefore, that both ease and enjoyment would be enhanced as familiarity with the medium increases.

Nevertheless, these initial difficulties do pose a problem in comparing writers using a totally familiar medium with others using one which is quite unfamiliar. Daiute (1985) discusses this issue at some length, commenting that nearly all studies are carried out when students are at this initial experimental stage. The interesting thing with our results is that the C group found revision easier, while the P group found editing easier. We do not know if the picture would remain the same if we administered another questionnaire after the students had been using the computers for several months. Our own experience tells us that after learning how to use spelling checkers, thesauruses, search-and-replace facilities, and how to move quickly around long texts using 'macro' commands (several complex commands condensed into one or two keystrokes), the computer users would also find editing easier on the computer. Nevertheless, as tertiary level writing teachers, we find this shift in emphasis away from surface level changes and on to macrostructural changes a welcome result of introducing the computer into writing classes,

remedying an area of neglect in our students' previous writing instruction.

One other problem we encountered was in interpreting student responses in the "effectiveness" sections (see Appendix 2). In retrospect, we saw that while the wording of questions 18-20 seems to be fairly explicit, there may have been some ambiguity as to the precise meanings of questions 15-17. Did students, for example, interpret "effective" as meaning that their end-products fulfilled the course goals effectively? Or that the computer was more effective as a writing instrument? We do not know the answer to this and are therefore reluctant to draw any conclusions from these responses.

Responses to questions 18 and 19 appear to be the most intriguing and perhaps also the most significant. The C group seemed to think the course was more effective than the P group did. The fact that more students in the C group thought the course effective in improving the organization of their work, as well as being a result of previously mentioned factors, could also have to do with non-productive labour. Because we asked students to produce at least two (and in the case of the final project, three) drafts of their assignments, this factor may be an important one. When students work on the word-processor, all their interventions produce meaningful results; that is, they simply revise text, and need not rewrite. When writing using pen-and-paper, the student faces a dilemma: either he rewrites the whole, or a large portion, of his text, which will involve extensive copying, or else he decides to avoid this even if he sees certain limitations in the organization of the information as it stands. If he rewrites, he can hardly see the activity as "effective". If he chooses not to, there may be a sense of frustration at leaving it in an unsatisfactory state. Perhaps it is this sense of frustration at being limited in what they can revise that influenced the notion of effectiveness for the P group. We discuss this idea further in section 3.2.

2.4. PROCESS

2.4.1. Methods

The three drafts of the long project were analyzed, using Faigley and Witte's (1981) taxonomy of revision changes as a basis. Since our main concern was whether there were any differences between the two groups in the way they revised (as opposed to edited) their texts, we confined ourselves to what Faigley and Witte call "Meaning" changes and ignored "Surface" changes (see 2.4.3a). All meaning changes were recorded using their Addition, Deletion, Substitution, etc. table, both at the micro and macro structural levels[5]. In addition, we also recorded the number of interventions each student made. Interventions are defined here as the actual number of changes, as opposed to the number of sentence units which were changed. Therefore a major deletion of say, 6 sentences, would be recorded as 6 in the Faigley and Witte taxonomy, but as only one intervention. This would enable us to look not only at the total number of sentence units that were changed but also at their distributions within the texts.

To make the analysis easier, the different strategies were colour-coded, using highlight pens. Since little evidence was found of Faigley & Witte's 'Consolidation' or 'Distribution' strategies, we only marked Addition, Deletion, Substitution and Permutation changes, although Consolidation and Distribution strategies were looked for.

Time did not allow us to examine the texts of all 25 students, so we chose to look at 6 student projects from each group. Students were ranked according to the grades given to them in the assessment and every alternate student in the rank order was chosen, giving a range of students from the most to the least proficient in each group.

2.4.2. Results (See Appendices 3a & 3b)

By far the most frequently made type of revision was Addition, both at the micro-(a total of 50) and at the macro-(95) structural levels. After that came Substitution (45), Deletion (30) and Permutation (29). We found very few Distributions (only 1, at the micro level) and no Consolidations.

There was a great deal of variation both within groups and between the two groups in terms of the number of revisions made. Within the P group the total number of revisions ranged from 10 to 26, and within the C group from 3 to 48. Both groups combined made more macro-(153) than micro-(98) structural revisions.

The C group made more revisions than the P group both at the micro- (55 compared with 43) and at the macro- structural levels (87 compared with 66). In total, the C group made 142 meaning revisions, while the P group made 109. The most significant macrostructural differences were found in additions, with 62 changes by the C group against 33 by the P group, substitutions, the P-group numbering 24 of these against 4 for the C group, and permutation, with 13 changes by the C group against 4 by the P-group.

The C group intervened more frequently in their texts (91 times compared with 65 times for the P group). It was also noted that the C group revisions spanned the entire text more frequently, while the P group were more inclined to limit extensive revisions to one section or chunk of text, with the exception of 1 student, who re-wrote the whole paper (the teacher had instructed the P group that they need not re-write the whole report, they could "cut and paste").

2.4.3 Discussion

a) Faigley & Witte's Taxonomy

The Faigley and Witte taxonomy proved useful in revealing what students tend to do when re-writing, but in a comparison of approaches along the holistic-atomistic spectrum, we may need to look at different parameters. Their distinction between **surface** and **meaning** changes, while clear enough in itself, does not allow for an analysis of other, equally important factors. We found some difficulty in interpreting their definitions of "Distribution" and "Consolidation" at the Macro-level, and felt that the "Permutation" category would prove more useful if defined differently.

In their paper, Faigley & Witte define 'surface changes' as those which do not affect meaning. They seem to overlook, however, the notion that surface changes can sometimes radically influence the type of attention given to a text by the reader. In our analysis of student reports, for example, students often inserted headings, sub-headings and numbering systems which dramatically altered the appearance of the text, and in some cases greatly enhanced the accessibility of the information. When categorizing such changes, we would probably label them "non-meaning change additions". This seems not to fully describe their impact on the communicativity of the text as a whole.

Some studies referred to by Alison Piper (1988), in her review of research on the subject, show that writers on word-processors become preoccupied with "surface-level" manipulations of the text, and editorial "fiddling about". One study (Harris 1985) found that even the best students made fewer "macrostructure" revisions when using the word-processor. "Inexperienced writers, those who do not typically revise, seem even less inclined to make major changes in the content and organization of their texts when they use the word-processor."

Cooperating with the reader, however, is an important part of communication and seems too vital a skill to have its manifestations dismissed as "surface" changes or "fiddling about" if it contributes to the enhancement of communication. Consideration of whether and where to make such changes requires a **holistic** operation on the text by the writer. A simple quantitative analysis, therefore, does not reflect the extent to which a "mere" surface change can alter the recipient's perception of the message - of its focus and level of assertiveness, for example. In short, while Faigley and Witte's taxonomy was invaluable in quantifying our data, we became aware of the dangers of relying too heavily upon it to determine degrees of writing competence in our students.

Another problem was that Faigley and Witte provide precise definitions of the various strategies in the context of "meaning-preserving surface changes" only, and leave the more difficult definitions of the meaning changes largely up to the reader; this is not helpful if one's concern is largely with meaning changes (see Note 5). What, for example, would be a "Consolidation" change at the macrostructural level? If we take consolidation to be a reduction of essentially the same information from, say, three sentences into one, then how would such a change affect a summary of the passage, which is what is necessary for it to qualify as a meaning change at the macro level? Certainly, we found this difficult to pin down. If the writer has summarized his information well, the original meaning will be retained. An effective consolidation change could therefore be recorded as a 'non-meaning surface change', while a poor one might be categorized as a 'macrostructural meaning change', or as a substitution, and not be recognized as consolidation at all.

Similar problems arise with Faigley and Witte's definition of **Permutation**. In applying this category to student texts we found two distinct varieties. First, some permutations were of the type where the writer re-orders the information in the same location, changing the order of information within a sentence or within neighbouring sentence units (as in Faigley & Witte's example om Note 5). This variety of permutation we might term **local permutation.**

However, often students would move a section of text to a totally new location, e.g. from a Discussion to a Results or 'Feasibility' section. In each of the interventions of this kind, the student was clearly revaluing the role and rhetorical function of the information being moved (see 2.4.3b below) and, in Faigley & Witte's terms, altering the 'meaning' of the text at the macrostructural level. This second type of permutation we might term **global permutation**, a re-location of information which shows a sophisticated rhetorical awareness, specific to the genre in question. A similar case could be made for the category of 'global distribution', but we could not identify any changes of this type in our small sample.

Certainly, more careful consideration of rhetorical purpose and genre in academic writing is needed if studies using the Faigley & Witte taxonomy are to be fruitfully compared.

b) Analysis of Revisions

The most significant differences between the types of changes made by the 2 groups between drafts were at the macrostructural level, particularly in the categories of Substitution, Addition and Permutation.

The greater number of macro-structure substitutions made by the P group seems due to a tendency to cross out or discard, and then replace an entire section of the report. The C group in the same position (given the same teacher criticism) tended to insert new propositions or chunks of text where deemed appropriate - hence the large number of Macro-structural additions.

Perhaps most interesting were the **Permutation** changes, especially those described above as 'global permutations'. Although these interventions were few in number (1 for the P group and 5 for the C group) and only occurred in 3 of the 12 scripts analyzed (1 P group and 2 C group scripts), they nevertheless amounted to a difference in actual sentence units changed of over 300% (4 for the P group and 13 for the C group), testifying to a sharpening of metadiscoursal awareness that we had not expected to find after such brief exposure to the word processor. The P group instance was a case of perceiving the redundancy of repeating in text what had been made eminently clear in a diagram. The writer retained only those propositions which drew attention to the most significant features of the scheme, placing them after the diagram.

The global permutation changes made by the 2 C group students all featured the retention and re-location of text while revealing an awareness that it had been given an inappropriate rhetorical "value". One of the 2 students realized that what he had called his 'Conclusion' was actually only adding qualification about potential drawbacks to his proposal, and so properly belonged in the section 'Recommended Scheme'. The other C group student, who had the most such interventions in his report (4), had first of all removed a rather philosophical introduction to his report, after some class discussion on the likely shared knowledge between the reporter and the targeted reader. He scaled down the frame of reference of the report, moving his 'Background to the Project' from p.3 to the opening section of the report. This writer had also begun his 'Feasibility' section outlining the purpose of the project; he proceeded to move this and create a separate 'Objective of the Report' section. Where he had included a criticism of an unsuitable form of energy in his description of the different energy sources, he proceeded to move these comments to the 'Objective of the Report' section, narrowing the scope of the report by eliminating a priori unsuitable energy sources. Finally, this writer had listed his 'criteria' for selecting energy options in his 'Recommended Scheme' section, on p.6 of his report. He moved these 'criteria' 3 pages forward to a separate section just prior to the 'Feasibility' section, realizing that one cannot discuss the feasibility of an option without knowing what criteria one is judging the options by.

In helping students to develop a sense of how well their writing fulfills its rhetorical goals, there seem to be clear advantages (over the Humanities-type essay) to working with a text format which encourages the assignment of information to the service of specific rhetorical macrofunctions (e.g. Background - Description of Energy Sources - Feasibility of Energy Sources - Recommended Scheme - Discussion - Conclusion).

Interpreting these data in terms of desirability of writing/revision strategy, we could say that the P method tends to encourage an 'all-or-nothing' approach to revision and, in the case of a report clearly segmented into sections, any 'holistic' approach would be confined to the level of a section, time and tolerance being the constraining factors. It is very difficult to insert single sentences, or small paragraphs into a larger text without adversely affecting its presentation (an important factor in reports), or opting for a total rewrite. Since they were given the possibility to make photocopies of their texts, cut them up and paste intact chunks of text onto their revised version, the P group students tended to think in terms of revising 'by section', opting to change those sections deemed least satisfactory. Where <u>most</u> of the text was acceptable, they decided to leave it alone. Conversely, where they felt unhappy with most of what they had written in a particular section, they chose to rewrite. It seemed to us that the focus was not so much on what should be **changed** but rather on what could be **retained**. Occasionally, however, a student would decide to rewrite a large section for the sake of making minor changes. In one extreme example, a student wanted to insert two sub-headings into the Introduction section of his report. He pasted a 20-line piece of paper over his old text having first recopied it exactly, except that his writing was slightly smaller to make room for his two additions. Interestingly, the 1 P group student who re-wrote his entire paper <u>still</u> produced a revision in which 50% of the text was unaltered, and therefore 50% of his time had been spent on redundant copying. One wonders how "effective" these (P group) students feel the revision stage of the writing process is in improving their work.

The process analysis ultimately throws the spotlight back on attitudinal factors like **punishment** and **re-writing apprehension**.

The C group seemed rather more willing to intervene in their texts. The relative ease with which they could add, delete or re-locate text meant they were able to focus on the overall rhetorical structure of their reports. Freed from the restrictions imposed by the need to re-write, they were more able to make a holistic appraisal of their texts. This would account for the larger number of macrostructural additions, deletions and permutations for the C group, with the "cut-and-paste or total rewrite" technique accounting for the P group's much greater number of macrostructural substitutions.

Other researchers, like Sommers, Perl, Raimes and Zamel, have told us that good writers revise more at the 'rhetorical' level. The use of the word processor, at both the primary writing and revision stage, would seem by that yardstick to be encouraging 'better' writing, with a greater awareness of the rhetorical function and patterns of information and of the accessibility of that information for the reader.

Finally, a word about our methodology. One might well argue that if we had required the P group students to rewrite the whole report they would have employed different revision strategies and would have intervened more frequently and more evenly throughout their texts, just as the C group did. This is undoubtedly true, but it also proves an important point. Our awareness of re-writing apprehension and sense of punishment made us reluctant to require this from students. These reports were approximately 3 - 7 pages long, with several diagrams. Is a teacher justified in requiring two rewrites from students, knowing that approximately half of the activity would simply be copying? We think not, and this may go a long way to explaining why so little instruction and practice is really given in revision strategies during writing classes.

Part 3 : GENERAL DISCUSSION

3.1. Writing Quality

We have already stated in the Discussion on Performance earlier in this paper that our basic teaching instincts told us before the study began that we could not expect to see any dramatic effect on writing quality simply by introducing students to writing on the computer. Our reading of relevant literature strengthened that conviction.

> "With all our efforts there is still no hard evidence to indicate that the computer use in itself makes one a better writer" (Pierson & Leung, 1987).
>
> "It would be absurd to say that word-processing leads to good writing" (Foulds, 1987).
>
> "The few studies of writing quality have shown that writing on the computer is sometimes rated lower than writing done by the same people with traditional tools" (Daiute, 1985).

Those writers who were prepared to say that computers actually improved writing quality did not, unfortunately, do it very convincingly:

> "Word-processors ... make on-screen editing so easy that they encourage the user to try out the effect of changing or adding words, changing the order of sentences or even paragraphs, and playing around with the aesthetic effect of different layouts. As a result they *seem to be affecting the quality* as well as the quantity of what is written on them" (Higgins & Johns, 1984 - our italics).

One cannot expect the mere opportunity to "play around" with layouts and "try out the effects" of changing words around in itself to improve the quality of students' writing. Writing programmes have to be designed around pragmatic principles so that the development of rhetorical, or 'metadiscoursal', awareness in students becomes a prerequisite for any improvement in what we are calling the 'writing process'. Without such an awareness, in the words of Daiute (1985), "all the word-processing commands in the world won't help".

Not surprisingly, then, our results from the Performance section lead us to a rejection of our first experimental hypothesis. The computer did <u>not</u> directly affect writing quality, at least in the short term - which in this case means 10 weeks or 20 hours of instruction. Nevertheless, results from the Attitude and Process sections of the study tend to confirm our two other experimental hypotheses and cause us to agree with Higgins and Johns that writing on the computer <u>will</u> affect writing quality - but for quite different reasons. Despite the short time-span of the study and the fact that students were, for the most part, novices with word-processors, the computer seems to have had a positive effect on student <u>attitudes</u> to writing. This was especially evident with regard to the ease with which they felt they could write and revise and their sense of the effectiveness of a computer-based writing course. The computer certainly had an effect on the <u>process</u> the students went through in revising their work.

It is these two aspects of the results - **Attitude** and **Process** - which we believe will improve writing quality in the long-term. If the computer changes the way **students** write and their attitudes towards writing, then these factors, together with the variety of writing aids the computer offers, will certainly affect the way **teachers** teach writing in the classroom

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3.2. Writing, Computers ... and Students

In our discussion on 1st draft and revised drafts in the Introduction we mentioned that most students do not have time to produce a preliminary first draft, revise and edit it, and then write out a neat copy. This point seems to have been confirmed by our pre-course questionnaire. Only one third of the students said they usually wrote a neat copy when writing with pen-and-paper, but most students said that they do spend some time revising/editing their work before handing it in.

If we accept that students do do some revising, we might expect that teachers would frequently receive assignments complete with crossings out, additions in the margins, arrows indicating relocations of text and so on. But this is not the case. Students are too concerned about the appearance and presentation of their work to hand in very untidy papers, a concern arising perhaps out of previous experience of critical responses from subject teachers. We are therefore left with two possible explanations for how students prepare their first drafts using pen-and-paper. Either they simply do not change everything that they know could be improved because this makes their work too untidy, or they spend a lot of time trying to express themselves clearly the first time and so avoid rewriting. It seems, in practice, that students do a combination of both. From a writing teacher's point of view this combination seems neither effective, nor desirable. Firstly, the student should ideally be able to feel free to make whatever changes he thinks are necessary to his text without worrying about 'ruining' his draft. Secondly, no matter how much thought and time goes into planning a piece of writing, it is extremely difficult to get a sense of how the whole structure fits together as an entity while writing.

Since the physical act of writing is a linear production process, the text can evolve in ways the writer had not at first intended, as a word, phrase or sentence/proposition sparks off a new idea. This process makes it difficult to distance oneself and get a clear picture of the whole text while writing. This can only be done through rereading once the draft is complete. It seems that, by using pen-and-paper, students are missing out on this important stage in the writing process. As we have said, rewriting apprehension and the drudgery of copying seem to play a large part in dissuading students from revising their texts. We can therefore postulate that a draft handed to a tutor is often not one a student feels satisfied with, but is the best he feels he can achieve under the constraints of time and energy.

Computers change the writing process in that their various text manipulation features allow writers to jump backwards and forwards in their texts, revise and rephrase, delete and insert and at the same time provide the writer with a hard copy at any stage. Once the first draft is completed the student can read and reread, make any number of changes without the generation of non-productive labour or fear of spoiling the presentation of the text. The student no longer faces the frustrating dilemma of whether to rewrite the whole, involving meaningless copying, or leave changes which he knows should be made but wants to avoid.

Writing on the computer means the student no longer has what Dalute describes as "a physical stake in producing final products on the first try because revising and even minor editing involve recopying." The text is as permanent or transient as the writer wishes to make it with the touch of a command key. The students' concept of a first draft is therefore likely to change, since he can now produce several printouts and revise each one before arriving at a relatively satisfactory result. Unlike writing with pen-and-paper, the 'word-processed' attempt will not be handed in to the tutor, but will be seen simply as a 'completed first draft'. The student can therefore exhaust his own intuitions about what is good or bad, what needs changing or leaving alone, before requesting feedback from a tutor. In consequence, the computer, despite its apparent complexity, is in many ways a more natural writing instrument than pen-and-paper,

allowing recursive editing and revising without the 'debris' of crossings-out and erasures. In addition, the printer offers the facility of 'freezing' this process at any stage in the writing process.

When students do revise on computers, they tend to revise more. They revise more both at the macro- and the micro-structural levels, and their interventions into their texts during revisions are more widespread. These results suggest the computer encourages a more holistic approach to revision and not the minor editing at the sentence level which at this preliminary stage of the process the medium of pen-and-paper encourages (except for those diligent few who are willing to recopy). Completed word-processed drafts are therefore more likely to be satisfying for the student, since the restraining factors of time and energy play far less of a role in his writing of assignments and in the revision strategies he employs. Rather it is his own abilities as a writer which determine the quality of his first draft.

3.3. Writing, Computers ... and Teachers

Just as the tape recorder and the language laboratory had an important effect on language teaching methodologies in their own ways (and in their own day), so the use of the computer is certain to affect writing classes. Unlike the language laboratory, the computer is not a "hothouse plant incapable of being transplanted to the environment of the world outside," (Phillips, 1986). The ubiquitous computer is here to stay, pervading society at every level. It is therefore unthinkable that the computer will be used for science classes, humanities lessons, even in the fine arts, but not for language teaching. In other words, it is not really a question of whether language teachers should use computers or not, but rather of how best to make use of the unique attributes of the computer to improve the quality of writing instruction.

In *Revising: Intentions and Conventions*, (1982), Ellen Nold discusses research (Gluckberg, Krauss, Higgins,1975) that indicates that it is not the quantity but the quality of teachers' comments on student papers that improves writing skills. The more explicit the teacher's comments, the better the students' responses. She also emphasizes the need for teachers to move away from judging finished drafts and to facilitate students' writing and revising of various drafts of the same paper. In other words, she advocates a process-oriented approach to writing instruction. She adds,

"As the quality of instruction improves, so should the quality of student writing."

We feel this is true, but as mentioned before there has always been an awkward, yet perfectly understandable, discrepancy between the theory of teaching writing as a process and the normal practice in writing classes. From our research, the computer emerges, if not as the 'perfect writing tool' in a process-oriented approach to writing, then at least as a vast improvement on pen-and-paper or the typewriter.

For a number of reasons we feel that, in the hands of responsible teachers, the word-processor will have a positive effect on teaching methods, allowing theory and practice to be satisfactorily merged in writing sessions for the first time. Following are some of the **pedagogical implications** we can see of using word-processors in the writing classroom:

a) Apprehension: Results from the post-course questionnaire suggest the computer plays a part in reducing re-writing apprehension and lessening the sense of punishment attached to re-writes; students feel that all the revising they do is meaningful and involves no non-productive work. This means that computers will be invaluable tools in enabling teachers to shift the focus onto revision, as a consistently meaningful and relevant activity rather than on rewriting, a largely mechanical and only partially productive activity.

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b) Process: This shift of focus will facilitate the teaching of writing as a process. Since students can begin writing knowing all the time that revisions are both easy and painless, teachers for their part will routinely and frequently require revisions from students. They will be able to do this for the first time without any professional qualms about the punishment and non-productive labour factors. Revising will be seen not as a punishment for a poor final product, but as a natural stage in the writing process, starting with a consideration of the rhetorical macrostructure of one's text, and gradually moving through to the lexico-grammatical editing stage.

c) Holistic Approach to Writing: Not only will teachers feel free to make comments on both rhetorical and linguistic features of student texts, but they will justifiably expect the students to act upon all of these in revising their work. This in turn will mean that students will develop the skill to see the text holistically, as an entity to be structured and restructured, and not merely as a series of sentences and paragraphs to be 'corrected'.

d) The Writing Syllabus: We predict that writing syllabuses will change. Revision sessions are more likely to become a common element in the writing syllabus than was the case with pen-and-paper. Students will not have to do time-consuming rewriting at home without recourse to a tutor to clarify annotated comments, explain guidelines and make suggestions. Instead, revision sessions will be built into the course design and students can make constant use of the valuable resource their peers and tutors offer. As computers become more commonplace, they will also hopefully be able to book time on their institution's computer facilities to carry on their revision out of class.

e) Individualization: Finally, the focal point of all writing classes for a student will be his own writing. One of the problems of group tuition is that students find it more difficult to perceive the relevance of a language point taught through someone else's work. It is not greatly motivating to have to continually abstract information about a linguistic system simply for its potential application to one's own writing.

No doubt many teachers will argue that, while it is all very well to emphasize writing and revising as a process offering individualized feedback, the teacher will be veritably swamped with student assignments to comment on. Not only one, but two or even three drafts of the same paper! Of course, there may well be more work for the teacher in that area, but the computer offers many other facilities which would reduce the wastage of teacher time. The need for tedious repetition of the same points of grammar, for example, whether written on the students' papers or explained orally in the classroom, could be largely eliminated if interactive software, featuring both grammar and rhetorical structure instruction and exercises, were accessible to students on computers while they were writing assignments. On-line thesauruses and spelling checkers would also cut down on teachers' time. The time saved on these mundane, repetitious tasks would leave teachers freer to concentrate on the procedural and pragmatic dimensions of writing and revising.

In the first chapter of Computers in Language Learning (1984), Higgins and Johns explain that their aim is not only to justify using computers, but also to discuss

> "the changes of attitude or approach that must accompany such use. The learners must be, to some extent, in tune with the medium before they can benefit from it."

There is no doubt that the same changes of attitude and approach towards the use of computers in the writing classroom are essential on the part of teachers and educators if they are to provide students with the best possible environment in which to improve their writing skills.

NOTES

1. H. Pauwels, at the University of Antwerp (Prinsstraat 13, B-2000 Antwerpen), has used this technique with some success.

2. After the Prague School: communicative dynamism can be described as that quality, or aggregate of qualities, in a text which impels a reader through that text, and which "pushes the communication forward". (Firbas 1971: 136)

3. "Rewriting is when playwriting really gets to be fun... In baseball you only get three swings and you're out. In rewriting, you get almost as many swings as you want and you know, sooner or later, you'll hit the ball". Neil Simon, quoted in Murray (1978).

4. In response to the last, and only open, question: *"Do you think the course has changed the way in which you write your assignments ? If so, in what way ?"*

5. Faigley & Witte describe their categories most clearly in terms of 'Meaning-Preserving Surface Changes'. We quote:

   "**Additions** raise to the surface what can be inferred (*you pay two dollars = > you pay a two-dollar entrance fee*). **Deletions** do the opposite so that a reader is forced to infer what had been explicit (*several rustic looking restaurants = > several rustic restaurants*). **Substitutions** trade words or longer units that represent the same concept (*out-of-the-way spots = > out-of-the-way places*). **Permutations** involve rearrangements or rearrangements with substitutions (*springtime means to most people = > springtime, to most people, means*). **Distributions** occur when material in one segment is passed into more than one segment. A change where a writer revises what has been compressed into a single unit so that it falls into more than one unit is a distributional change (*I figured after walking so far the least it could do would be to provide a relaxing dinner since I was hungry = > I figured the least it owed me was a good meal. All that walking made me hungry.*) **Consolidations** do the opposite. Elements in two or more units are consolidated into one unit (*And there you find Hamilton's Pool. It has cool green water surrounded by 50-foot cliffs and lush vegetation. = > And there you find Hamilton's Pool: cool green water surrounded by 50-foot cliffs and lush vegetation*). As the last example suggests, consolidations are the primary revision operation in sentence-combining exercises." (Faigley & Witte 1981, p.402)

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24

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APPENDIX 1

PERFORMANCE

	UE (June '87) Pass Grades A=Highest E=Lowest		Pre-Course C-Test (Sept '87) Max = 100		Pre-Course Writing Test (Sept '87) Max = 14		Projects (February '88) Max = 14 Markers 1		Markers 2		Post-Course Writing Test (Feb '88) Max = 14	
	Grade	St No	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Pen-and-Paper Group	C - 3 D - 4 E - 6		53.5	2.3	8.3	0.8	7.9	1.8	7.6	1.3	7.8	1.5
Computer Group	C - 1 D - 3 E - 7		51.2	8.0	8.6	2.0	8.5	1.1	7.4	1.3	9.4	1.3
Significance	P+P Group slightly better?		$p<0.05$ (MW)		None		None		None		$p<0.02$ (t) $p<0.05$ (MW)	

ATTITUDE

Group Averages for Questions 15 - 20 on Post-Course Questionnaire
(Administered February 1988)

SCALE KEY

1 ——— 3 ——— 5

Very Enjoyable - Very Boring
Very Easy - Very Difficult
Very Effective - Useless

	ENJOYMENT		EASE		EFFECTIVENESS	
How did you find:	P+P	Com	P+P	Com	P+P	Com
15 writing your assignments?	2.8	2.6	2.9	2.6	3.3	2.4
16 revising the organization of your work?	3.1	3.2	2.8	2.6	2.9	3.0
17 editing the grammar, spelling, vocabulary?	3.3	3.6	2.7	2.9	2.7	2.9
TOTALS	**9.2**	**9.4**	**8.4**	**8.1**	**8.9**	**8.3**

	EFFECTIVENESS	
How effective do you think the writing course has been in improving your ability to:	P+P	Com
18 write your assignments?	2.6	2.1
19 revise the organization of your work?	2.9	2.5
20 edit for grammar, spelling, vocabulary etc?	3.2	3.2
TOTALS	**8.7**	**7.8**

APPENDIX 3A

PROCESS

Number of Revision Changes made by each Student in each Category for Long Project (Drafts 1 to 2)

		PEN-AND-PAPER GROUP (Most Proficient <----------> Least Proficient)							COMPUTER GROUP (Most Proficient <----------> Least Proficient)						
	STRUCTURE CHANGES	A5	A10	A4	A8	A1	A11	TOTAL	B5	B1	B12	B11	B10	B7	TOTAL
MICRO	Addition	1	5	6			9	21		5	6	12	6		29
	Deletion		5		4	2	1	12	2			2	1		5
	Substitution		6		1			7	3	3		1	1	3	11
	Permutation		2				1	3		6		2	1		9
	Distribution							-	1						1
	Consolidation							-							-
	SUB-TOTAL	**1**	**18**	**6**	**5**	**2**	**11**	**43**	**6**	**14**	**6**	**17**	**9**	**3**	**55**
MACRO	Addition	9	3	2	9	5	5	33	7	4	21	13	17		62
	Deletion						4	4			3	6			9
	Substitution		5	6		11	3	25				3			3
	Permutation				4			4				9	4		13
	Distribution							-							-
	Consolidation							-							-
	SUB-TOTAL	**9**	**8**	**8**	**13**	**16**	**12**	**66**	**7**	**4**	**24**	**31**	**21**	**-**	**87**
	TOTAL MICRO/MACRO CHANGES FOR EACH GROUP							**109**							**142**

APPENDIX 3B

Total Revision Changes in Second Drafts for the Computer and Pen-and-Paper Groups

		Pen-and-Paper Group	Computer Group
MEANING CHANGES			
A	MICROSTRUCTURE Changes		
1	Additions	21	29
2	Deletions	12	5
3	Substitutions	7	11
4	Permutations	3	9
5	Distributions	-	1
6	Consolidations	-	-
B	MACROSTRUCTURE Changes		
1	Additions	33	62
2	Deletions	4	9
3	Substitutions	25	3
4	Permutations	4	13
5	Distributions	-	-
6	Consolidations	-	-

Total Number of Combined Revision Changes and Total Interventions in Second Drafts for Computer and Pen-and-Paper Groups

		Pen-and-Paper Group	Computer Group
A	MICROSTRUCTURE Changes	43	55
B	MACROSTRUCTURE Changes	66	87
C	TOTAL Changes (Sentence units)	109	142
D	TOTAL INTERVENTIONS	65	91